SCIENCE.

FRIDAY, AUGUST 13, 1886.

COMMENT AND CRITICISM.

CONSIDERABLE INTEREST has of late been taken in the study of the etiology of pneumonia. Some believe it to be due, in the majority of cases, to microbes, and base this opinion upon the discovery of four varieties of micro-organisms in lungs affected with the disease; others find a marked relation between its prevalence and the increased amount of ozone in the air, either just at the time or immediately preceding. Dr. Seibert has made a study of 768 cases of primary pneumonia, which were reported to him by the members of the New York medical society, and which occurred in their practice during twelve months. These cases were distributed as follows: January, 71; February, 140; March, 103; April, 73; May, 55; June, 37; July, 26; August, 25; September, 43; October, 62; November, 65; December, 78. The results of Dr. Seibert's investigations are, 1°, that the varying prevalence of pneumonia may be explained by changes in temperature, humidity, and velocity of the winds; and, 2°, that, whenever there exists a low or falling temperature with excessive and increasing humidity and high winds, pneumonia prevails to its greatest extent. If two of these conditions exist without the third, the disease will be markedly prevalent, but not so much so as in the preceding instance. Catarrhal troubles are also favored by the same conditions.

THERE HAS RECENTLY BEEN PUBLISHED a biography of Se-Quo-Yah, styled the American Cadmus. Born in 1770, of a Cherokee mother whose European husband had deserted her, he grew up as the pride of his people, both in games and war. One day (so the story goes) a white captive produced a letter, and everybody wondered at the 'talking leaf.' Se-Quo-Yah (which translates suspiciously into 'he guessed it') pondered over the mystery, and with the use of an English spelling-book which had fallen into his hands (but which of course he could not read), invented a written alphabet for his people, making the English characters, with modifications and additions of his own, stand for the eighty-two syllables of which the Cherokee language is composed. He analyzed the spoken speech, and had each distinct syllable represented by a sign. His tribe at first considered him as weak-minded, but eventually recognized the utility of his invention. Five years after the invention he had a school with many scholars, and a printing press was publishing a Cherokee paper, part of which was printed in the Se-Quo-Yah alphabet. This invention is referred to as the means of civilizing the Cherokee nation. The story is unfortunately not sufficiently clear to enable one to appreciate just how much of the idea was original with Se-Quo-Yah, or to claim for him the honor of doing by a flash of genius what in other races had been slowly worked out before history began.

IT IS A PREVALENT popular impression that some special providence surrounds the physician with protective agencies, and that, although daily exposed to disease in its most malignant forms, he escapes when others are attacked. Dr. Ogle of England finds that while the lawyers die at the rate of 20, the clergy at the rate of 16, the doctors' mortality is 25 per 1,000. In a million adults other than physicians, 16 died of scarlet-fever, 14 of diphtheria, and 238 of typhoid-fever; while, of an equal number of physicians, 59 succumbed to scarlet-fever, 59 to diphtheria, and 311 to typhoid-fever. Small-pox, on the other hand, claims more victims among the laity than in the medical profession; due, doubtless, to the fact that physicians have sufficient confidence in the protective influence of vaccination to keep themselves insusceptible to the attacks of small-pox.

DR. LINCOLN, in the 'Report of the Massachusetts state board of health for 1884,' says that a child who enters a public school has become a fractional part of a machine. He has been well understood by persons who have watched him from birth, and who are deeply interested in him. He is now transferred to the care of strangers, who meet with him only five hours in the day, and whose interest in him is restricted by the fact that he forms but a portion — say, from one and one-tenth to two and one-half per cent — of the

total group of children that is intrusted to the care of the teacher. He is held by the teacher, and then passed on to another again as a fraction, and not as an integer. Does he not lose much, as well as gain, by this system? As regards his health, he loses that defence which the sympathy of the community always extends to that individual who is suffering conspicuously. Taken generally, all children in school are suffering from discomfort. Average this discomfort among ten thousand, and it may not be very great for each one; but a class of fifty children is not made up of fifty averages.

THE AMERICAN ASSOCIATION AS A MISSIONARY BODY.

Two years ago we published some statistics concerning the membership of the American association which were somewhat curious. The figures then given dealt simply with the geographical distribution of the members; and they showed, among other things, that one-third of the association came from the states of New York and Massachusetts. If the north-eastern states, that is, New England and the Atlantic states to the Virginia line, had been counted, it would have been found that these included fully three-fifths of the association.

It could also be shown that during the last ten years, when only four of the ten meetings have been held in the north-eastern states, the average attendance of members from this section has been 53 per cent of the whole attendance, increased to 76 per cent when the meetings have been held within its own territory. It has even been larger than the territorial representation in two instances, as at the St. Louis meeting of 1878, when it was larger than the representation of all the states west of the Mississippi; and at the Montreal meeting of 1882, when it was five times as large as the entire Canadian membership present. At the other extra-territorial meetings, where its proportion of the total attendance has varied from 24 per cent to 37 per cent, it has easily held the second place, though falling below the local representation of large areas. Indeed, the representation of no other section, excepting of the northern states lying east of the Mississippi and west of the Atlantic states, ever has more than a passing importance, viz., when the meeting is held in that section. Thus Canada's representation has never been more than 3 per cent of the whole in any meetings of the last ten years, excepting in 1882, when it was held in Montreal and the percentage rose to 14 per cent; the next year however it fell to 2 per cent, and, omitting 1882, the average has been less than 2 per cent. In this same period the states west of the Mississippi have averaged a little more than 4 per cent, and have never reached 6 per cent, excepting when the meeting was held at St. Louis in 1878, when it rose to 31 per cent, and at Minneapolis in 1883, when it was 15 per cent. The southern states have done better than this, for at the Nashville meeting in 1877 their average was 37 per cent of the whole, and though at no other time (even at St. Louis) have they exceeded 12 per cent, their general average, apart from the Nashville meeting, has been over 6 per cent.

It is, however, a matter of practical importance, in deciding where a meeting shall be held, to know how large a general attendance of members to expect, and here the statistics show some further significant facts. The general proportion of members in attendance to total membership during the past ten years has been 30½ per cent, but the proportion has varied enormously, as may be seen by the following serial figures, from 1876 down: Buffalo 25 per cent; Nashville 17 per cent; St. Louis 14 per cent; Saratoga 25 per cent; Boston 63 per cent; Cincinnati 27 per cent; Montreal 48; Minneapolis 20 per cent; Philadelphia 49 per cent; Ann Arbor 17 per cent. While it should not be forgotten that it is one part of the association's work to look upon the meetings as in some sort a missionary enterprise, neither should it be overlooked, when it is asked to hold an undue proportion of its meetings away from the centres where it gains its main financial and moral support, that such assemblies are held *in partibus infidelium*.

It might be sagacious to institute an inquiry as to the length of time for which new members, gathered in from the district immediately surrounding a place of meeting, are held. That membership changes largely from year to year is a well known fact; that it is largely recruited from the places where the meetings are held is sufficiently obvious to any constant attendant. But what shall we say when we discover that Buffalo, which a month hence can point to itself with pride as the only city which has harbored the association for a third time; that Buffalo, situated in the region which these statistics have shown is most favorable for science, where two or three local societies for the cultivation of the natural sciences have sprung up, where scientific periodicals have found a home and a patronage; that Buffalo, renowned for its hospitality to science, literature, and art, where ten short years ago the association was enlarged by nearly one hundred and fifty members, twenty-five of them its own citizens,—

has at present only seven members on the association's rolls, three of them the sole survivors of the twenty-five. Was it for missionary service that Buffalo called the association to its open doors? Does Buffalo look upon itself as *in partibus infidelium?*

THE TRANSCASPIAN RAILWAY.

THE Transcaspian railway was opened for traffic on the 14th of July as far as Merv. The operations must already be far advanced on the Merv-Bokhara-Samarcand branches, for the names of railway stations, the distances, and other details over the whole length of the railway, from the Caspian to the Turkestan frontier, are already known. The following are fresh particulars of this important central Asian strategical railway:

There are altogether 63 stations from Michailovsk, on the bay of that name on the Caspian, right through the deserts and oases of the Transcaspian, across the Amu Darya and Bokhara to Samarcand. These do not include the new branch of 25 versts, made from Michailovsk along the Caspian coast to Ousun Ada, in order to have deep water for the connecting sea service, and to avoid the reshipment formerly necessary between Krasnovodsk and Michailovsk. The distances between these stations vary from 15 to 33 versts, being in most cases from 22 to 25 versts.

The whole distance of the line when completed as far as Samarcand will be 1,335 versts. The distances in Central Asia have become so exaggerated in most minds that few persons would imagine that they might travel by this new railway right through the Transcaspian Steppes, over the Oxus, and from one side of Bokhara to the other, coming out at Samarcand, in something like a day and a half, or less.

The first, or western, portion of the railway runs through a desert, crossing now and then an oasis, then traverses the cultivated territory of Bokhara, and ends at Samarcand in Russian Turkestan. The desert stretches along the line 148 versts between the sea-coast and Kazandjik, and 69 versts from the latter station to Kizil Arvat. The Akhal Tekee oasis extends as far as Gheours, 237 versts. The furthest point south, Doujak, is distant from the sea 581 versts, from Askabad 159 versts, Merv 167 versts, and Samarcand 754 versts. The railway traverses 300 versts of Bokharan territory. Were the line made from Merv over Burdalisk and Korti, instead of Charjui, 100 versts would be saved, and the distance between Michailovsk and Samarcand would be only 1,200 versts, or 800 miles, instead of 890 miles; but the Bokharan government, for some reason or other, did not consider that this shorter route would so well serve the interests of their country.

The principal stations are those of Askabad and Samarcand. Besides post and telegraph offices, lodging houses have been already partly built at several stations for travellers, though nothing in the way of luxury will be provided, as may be imagined. According to the time-table, the trains will run 20 versts an hour. In the event of war, the number of trains departing may be increased to 12 per day.

The railway at present is only a single line. Although many of the stations are situated in waterless deserts, they are all furnished with water in one way or another. At Michailovsk there is Nöbel's machinery for converting the sea water into fresh water, and at several stations large cisterns are to be regularly supplied, either through pipe lines or by water trains. Artesian wells have also been dug, and good water has been found between Michailovsk and Molla Kary, and at other points. Not far from Bala Isshem, the railway also has its own petroleum sources, connected by a branch line.

THE RECENT ERUPTION IN NEW ZEALAND.

A STEAMER which recently arrived at San Francisco from Australia brings further details of the great volcanic disturbances in New Zealand. Heavy earthquakes were still felt in the Tarawera and Sulphur Springs districts, and severe shocks continued in the Rotoli district. A relief party that was sent out reported that Lake Tarawera had fallen considerably. The oil bath at Whakarewarewa was throwing up stones and mud to the height of twenty feet, and the great boiling lagoon of Papatangi would suddenly rise as much as two feet, and then as quickly fall. A similar phenomenon was observed at the Kuirrau caldron, which would rise two feet in half an hour, and then as quickly return to its normal level. Mr. Dinsey, the telegraph officer in charge of the Rotonea station, near where the eruptions and earthquakes were heaviest, reported on June 25 that volcano No. 1 was dead, and that Nos. 2 and 3 were steaming. No. 4 was still throwing up mud. Lake Rotomahana was comparatively quiet, with only one geyser in the centre playing. The Pink Terrace geysers were still blowing up clouds of steam, but were less active than they had been. The immense crevasse created between Tarawera and White Terrace continued to steam, and the cone on top of Tarawera Mountain was throwing out volumes of black smoke and steam. The New Zealand *Herald* says: "On Galatea Plains the

volcanic showers of mud at times took very eccentric courses, overleaping one section of land and then striking another further on, in the same line. Dr. Hector, who is making a scientific examination of the volcanic districts, said he expected that the volcanic cone which was thrown up in Lake Rotomahana during the disturbances had already on July 1 attained a height of six hundred feet, and was daily adding to its stature. He has named it Mount Hazard, after the gentleman of that name who lost his life on the first night of the great eruption. A chemical examination of the volcanic ashes shows that they are mostly composed of fine basaltic soil. Every human being has abandoned the entire portion of country situated within the limits of the volcanic system. Photographers were busily engaged taking views of the region."

GAS SUPPLY.

Numbers two and three of the publications of the American economic association are covered by a monograph, entitled "The relation of the modern municipality to the gas supply," prepared by Edmund J. James, Ph.D. The pamphlet contains a thoroughgoing investigation of the various systems of gas supply, and for that reason should commend itself to all interested in municipal administration and economic phenomena. The author, as is well known to readers of *Science*, is disposed to widen the sphere of state activity, basing his reasoning on philosophic conceptions. The present discussion, however, is not limited to a scholastic treatment, but assumes an intensely practical form. It is viewed from two standpoints: that of the individual, who is interested in obtaining a good quality of gas at a low price; and that of the municipality, which is interested in acquiring a revenue by legitimate economic methods. On both these points, Dr. James supplies abundant data. He shows how many European, and especially English, cities have been able to save large sums for the taxpayers by managing gas trusts on a business basis; while on the other hand, "the general opinion in England seems to be that the gas furnished by the public companies is better than that made by private companies." The experience of city upon city is adduced to support the belief that a transfer of ownership from private parties to municipal authorities would be of immense benefit. In the United States, there are at least three city corporations, Philadelphia, Richmond, and Wheeling, which undertake the manufacture and sale of gas. In each of these the results, upon the whole, have been favorable. The monograph is enriched by statistical information which makes it exceedingly serviceable; and the thoroughness of the work augurs well for the series of publications which the Economic association has undertaken.

LONDON LETTER.

Several weeks ago, attention was drawn in this correspondence to a remarkable outbreak of scarlatina in a London district, in which the hypothesis that the disease had spread from the milk drawn from one particular farm, seemed to be suggested and supported by the facts of the case. The proof, then wanting, that the disease of the animals could really produce scarlatina in man, has now been supplied by the investigations of Dr. Klein (conducted mainly at the 'Brown institution'), whose report has just been issued by the local government board. Four calves were inoculated with the matter from sores on the udders of the diseased cows, and similar sores were produced in them. Dr. Klein states that this disease, thus artificially produced in the calf, 'bears a close resemblance to human scarlatina,' and he specially quotes the appearances found in the kidney of the animal as indicative of the scarlatina attack. It is remarkable, however, that the milk of the affected cows is harmless, and does not contain, *per se*, the germs of the disease, but that it is contaminated after it has passed from the udder of the cow. Dr. Klein says that the fingers of the milker must of necessity bring down into the milk diseased particles from the ulcerations on the teats of the animal, and he points out that in the milk 'the disease germs find a good medium in which to multiply.'

As the last important act of his present official existence, Mr. Mundella, the president of the board of trade, has just announced that a 'Fishery department' is to be forthwith created, with an assistant secretary of state at its head. Mr. Berrington, who is to be the chief inspector, will be recognized as the right man in the right place, since he has already won his spurs as the successor in that post of Professor Huxley. The new department promises to be strong in practical knowledge.

The latest large engineering scheme which has been broached is that for a tunnel between Scotland and Ireland, at two points (Port Patrick and Donaghadee) where the distance from land to land does not exceed twenty miles. A shaft is to be sunk at once to test the strata. The cost of the tunnel has been estimated by competent authorities at $25,000,000, and that of the land approaches on either side, $5,000,000 more. The distance from Moville, in Lough Foyle (where the Allan line steamers now call), to London will be

four hundred and fifty miles, or eleven hours' rail. No American lines would land mails and passengers at Queenstown, when they could be delivered by the new route much earlier in Scotland, Lancashire, and London.

It is on many accounts to be regretted that the necessary capital for the Manchester ship-canal has not been subscribed within the time-limit allowed by the act of parliament authorizing its construction. Another opportunity will be afforded next year. It is to be 35 miles long, and a contract for its construction had been taken for $28,750,000. The depth is to be 26 feet, and the bottom width 120 feet. There will therefore be ample room for the largest ocean steamers to pass each other, and such delays as on the Suez canal cannot take place. The 60 feet difference of level between the two ends will be surmounted by four sets of locks. It is estimated that the labor of 20,000 men will be required for four years to complete it.

Science will be represented in the new house of commons by Sir John Lubbock, Sir Henry Roscoe, Mr. Nevil Story Maskelyne, and Sir Lyon Playfair, who, now that he is released from the cares of office by the resignation of the Gladstone ministry, is intending to make his usual autumnal visit to the United States with Lady Playfair.

The following telegram from Paris on electrical transmission of force, appeared in the *Times* of July 26:—

"During the last ten years M. Marcel Deprez has been engaged in experiments connected with the transmission of force by means of electricity. The Rothschilds some time since provided him with an unlimited credit to prosecute his researches at Creil, under the inspection of a commission of thirty-eight men of science. On Friday the commission met to hear a report on the results at present obtained, drawn up at their request by M. Maurice Lévy. This report was unanimously approved. It appears from it that we can now, with only one generator and only one receptor, transport to a distance of about 35 miles a force capable of being used for industrial purposes of 52-horse power, with a yield of 45 per cent, without exceeding a current of 10 ampères. When the amount of force absorbed by the apparatus used to facilitate the recent experiment, but not required in the applications to industrial purposes, is added, the yield will be nearly 50 per cent.

"The commission certifies that the machines now work regularly and continuously. The maximum electro-motive force is 6,290 volts. Before the construction of the Marcel Deprez apparatus the maximum force did not exceed 2,000 volts. The report states that this high tension does not give rise to any danger, and that no accident has occurred during the past six months. The commission is of opinion that the transmitting wire may be left uncovered on poles, provided it be placed beyond the reach of the hand. It estimates at nearly £5,000 the probable cost of the transmission of 50-horse power round a circular line of about 70 miles. This price would, however, be much diminished if the machines were frequently constructed.

"The commission, in the name of science and industry, warmly congratulated M. Deprez on the admirable results which he had obtained, and expressed thanks to the Rothschilds for the generous aid extended to the undertaking."

In connection with this, attention may well be drawn to an admirable little book on this whole subject of the electrical transmission and distribution of power, just published, from the pen of Mr. Gisbert Kapp, in Whitaker's 'specialist' series. It contains a clear and concise summary of principles, and a detailed account of what has actually been accomplished.

The forest fires which have been desolating an important section of Algeria seem at last to have burnt out. During the Roman occupation, Tunis probably contained twenty millions of people; now the most favorable estimates do not place the population at more than one million and a half. At one time the regions at present so barren were wealthy with crops, as shown, for example, by the frequent ruins of Roman oil mills. In those days the country was covered with luxuriant forests. In Bruce's day, one hundred and twenty years ago, allusion is made to forests where now not a single tree is visible. Yet the soil is still there, only waiting to be stirred into life by rain. Every country off which timber has been cut or burnt without discretion is feeling more or less the same inconvenience. Let the United States and Canada take warning!

The institute of naval architects is now holding its summer session at Liverpool, under the presidency of the Earl of Ravensworth. Chief-engineer Parker, surveyor to Lloyds, read a paper on the progress and development of marine engineering, in which he illustrated by tables and diagrams the improvements effected during the past few years. Mr. William John, the manager of the Barrow ship-building company, then read a paper upon 'The construction of Atlantic passenger steamers,' in which he pointed out that none of the English transatlantic liners had yet been fitted with the latest modern improvements for economy of fuel or quick combustion, such as triple-expansion engines or forced draught, which some of the

heaviest subsidized French and German transatlantic steamers possessed. He argued strongly in favor of twin-screw propulsion, on which point the discussion that followed mainly turned. The views of the author were strongly supported by Mr. H. White, chief constructor to the navy, who stated that in 1878, on the basis of admiralty data, he had said every thing in favor of twin screws that Mr. John had stated in his paper. W.

London, July 31.

NOTES AND NEWS.

It may interest our readers to see the following table of percentages on which some comments are offered in another part of the paper. These percentages represent the proportion of members from the region designated to the total membership registered (exclusive of Europeans) at the meetings of the American association for the advancement of science during the last ten years.

	Canada.	North-eastern states.				Other northern states. East of Mississippi.		Other northern states. West of Mississippi.		Southern states.
	Montreal, 1882.	Buffalo, 1876.	Saratoga, 1879.	Boston, 1880.	Ph'delphia, 1884.	Cincinnati, 1881.	Ann Arbor, 1885.	St. Louis, 1878.	Min'apolis, 1883.	Nashville, 1877.
Canada.....	14	3	3	2	3	1	2	1	2	0
N.-east. states.	65	68	80	84	73	29	37	35	33	24
Other north'n states. East of Mis.riv.	14	19	8	7	12	54	49	19	47	13
Other north'n states. West of Mis.riv.	3	4	3	4	5	5	5	31	15	5
South'n states.	3	5	5	3	8	10	7	12	4	57
Total att'd'ce exl. Europeans	918	199	258	979	978	542	364	132	328	166

— At the Buffalo meeting of the American association it is proposed to devote especial attention to the study and discussion of the interesting phenomena of the Niagara Falls and the gorge below. On Friday, August 20, one or more preliminary papers of an expository and suggestive nature will be given, intended to prepare the way for a short field-study of the falls and the gorge, which will occupy Saturday. Monday forenoon will be devoted to the discussion of the gorge and the problems to which it gives rise. A new survey of the falls has been arranged for, so that a considerable addition to the data for the computation of the rate of recession will be at command, and it is expected that new observations in other important lines bearing upon the chronology of the gorge will be presented, and will throw fresh light upon the history of the formation and recession of the falls and upon the utility or untrustworthiness of the gorge as a geological measure of time.

— Among the few local scientific societies of the United States, the Wyoming (Penn.) historical and geological society is especially to be commended for its activity. The second volume of its Proceedings, just published, contains, among other historical papers, several of interest on the local geology of the Wyoming valley. It would seem that the scope of the society might very profitably be widened so as to include other fields of scientific research in natural history.

— The 'Third annual report of the Wisconsin experiment station' deals with a variety of subjects, chiefly the results of experiments on crops, feeding, the composition of food-stuffs, fertilizers, etc., by Professors Henry and Armsby, together with more strictly botanical papers by Professors Trelease and Seymour.

—The 'Report of the life-saving service for 1885' presents not a few facts of interest deserving attention. One can only rightly appreciate the great importance that this branch of the public service has attained by the examination of the results as given for the past year in this report. The entire number of stations in operation was 203, of which 157 are on the Atlantic coast, 38 on the lakes, and seven on the Pacific coast, with one on the Ohio River at Louisville, Ky. The entire expense for the support of these stations during the year was less than $800,000, — not one-fourth as much as the value of the actual property saved. According to the report, there were 256 disasters to documented vessels during the year within the field of station operations. There were on board these vessels 2,206 persons, of whom 2,196 were saved, and only 10 lost. The estimated value of the vessels was $3,519,550, and that of their cargoes, $1,084,905, making the total value of property involved $4,604,455. Of this amount, $3,352,760 was saved, and $1,251,695 lost. The number of disasters involving the total loss of the vessels was 56. Besides the foregoing, there were 115 disasters to smaller crafts, from which 231 persons were saved, with the loss of only one life. The total loss of life was the smallest ever reached by the service, except in the year 1880, when but nine persons were lost. During the fourteen years' existence of the present service the total value of property saved has amounted to over $35,000,000, and there have been over 25,000 persons saved, with only 457 lost out of all those endangered. These figures seem almost incredible, and speak

volumes for the efficiency of the service, reflecting the greatest credit, not only upon the superintendents and directors, but upon the keepers and crews of all the stations as well.

— Mr. W. M. Davis has recently given in the *American meteorological journal* an account of the derivation of the term 'trade-wind.' The original meaning of the word 'trade' has been so far replaced by an acquired meaning, that a popular error has arisen as to the derivation of the common term, 'trade-wind.' Webster's dictionary says the trade-wind is "so called because of great advantage to navigators, and hence to trade." Worcester's dictionary explains it as "so called because favorable to commerce." But looking further back, the following extract from Skeat's etymological dictionary is instructive: "Trade-wind, a wind blowing in a constant direction, formed from the phrase, 'to blow trade,' to blow always in the same course." A step further discovers that trade is "properly that path which we 'tread.' . . . It once meant, literally, a 'path.' . . . The M. E. [Middle English] words are 'tred' and 'trod,' both in the sense of foot-mark. All from the A. S. [Anglo-Saxon] 'tredan,' to tread." The following extracts show the early use of the term, two or three centuries ago, by the navigators of that time: Hakluyt wrote, "The wind blowing trade, without an inch of sail, we spooned before the sea" ('Voyages,' iii. 849, published in 1600). Dampier said, "Trade-winds are such as do blow constantly from one point or quarter of the compass. There are divers sorts of these winds; some blowing from east to west, some from south to north, others from west to east, etc. Some are constant in one quarter all the year; some blow one-half the year one way, and the other six months quite contrary; and others blow six months one way, and then shifting only eight or ten points, continue six months more, and then return again to their former stations, as all these shifting trade-winds do" (Discourse of the trade-winds, in his 'Voyages and descriptions,' London, 1705, vol. ii. part iii. pp. 1, 2).

— The 'Fourth annual report of the U. S. entomological commission,' after much seemingly unnecessary delay on the part of the public printer, has recently appeared, and forms a worthy addition to the preceding volumes. It deals chiefly with the cotton-worm, with a chapter on the boll-worm — two of the most injurious insect pests that the south, at least, has to combat. The subjects are treated fully, and a large share of attention is devoted to the consideration of insecticides and insecticide apparatus, fully justified by the importance of the subject. The losses of crops in some places in the south during different years from the depredations of the cotton-worm or larva of the cotton-moth (Aletia), are very heavy, the total estimated loss for a single year of severe depredation throughout the southern states being as high as thirty million dollars, while the average annual loss for the fourteen years following the war is placed at fifteen million dollars. The chief objects of such entomological investigations are, of course, the discovery or improvement of remedies and of their methods of application, the results of which, both positive and negative, in this case indicate that arsenical compounds and pyrethrum, both first suggested by Dr. Riley, are the most efficacious. The boll-worm (Heliothis), on account of its wide distribution both north and south, and the almost indifference in the choice of its food-plants (or food-habits, for it is omnivorous, carnivorous, and cannabalistic), is but little less injurious a pest. The northern agriculturist, or even the northern housewife, is only too familiar with it for its injuries to growing corn in the ear. Their depredations are within the boll or pod of the cotton, and often render whole fields valueless. Aside from the more practical nature of the work accomplished, chiefly by or under the direction of Professor Riley, the report contains considerable matter of more strictly scientific interest on the habits, etc., of different insects, including a chapter on the anatomy of Aletia by Dr. Minot and Mr. Burgess.

— The Prince of Monaco sailed from the military port of Lorient July 14, in company with Professor Ponchet, to pursue a series of observations on the Gulf Stream. He carried with him five hundred floats, so constructed as to be affected by naught save the currents, to be placed in the water near the twentieth degree of west longitude, between the latitude of Cape Finisterre and that of the south of England. In addition, he has fitted out with the necessary appliances for deep-sea and surface zoölogical collecting, which will be pursued during the voyage.

— A marked improvement in the criminality of Spain has been apparent during the last few decades. In 1843, with a population of twelve million, there were 17,683 crimes against the person, and 10,425 against property; while in 1884, with a population of seventeen million, the numbers had decreased to 9,187 and 9,599 respectively. These figures are, however, yet very high in comparison with those of France. Thus, during 1883 there were 1,457 homicides or assassinations in Spain against only seven hundred in France, with more than double the population. Infanticides, however, are proportionally less common. It is

a noteworthy fact that the professional criminal is not nearly so common in Spain as in France.

— The Entomological society of Washington, founded but two years ago, has given an evidence of its activity by the publication of the first part of its first volume of proceedings. There can hardly be any place in the United States so favorably located as Washington for an active entomological society, and the list of well-known entomologists enrolled as members is an assurance that much can, and we believe will be, accomplished by the society.

— Statistics from a German periodical give a very unfavorable showing of the crowded condition of Berlin. Of the forty thousand houses contained in the city, one half have from twenty to thirty tenements each, while in another thousand or more there are a still greater number of tenements. Among these apartment or tenements there are seventy-five thousand consisting of a single room, inhabited by two hundred and seventy thousand people, or an average of about four to each room. The apartments divided into two rooms also number about seventy-five thousand, occupied by three hundred and sixty thousand persons. The houses in the poorer quarter are five or six stories high, and built so close to each other that there is insufficient light and air. Filth and repulsive odors are the inevitable result. The promiscuous crowding into single rooms of adults and young of both sexes, naturally results in debased morals, and the city is renowned for the extravagant number of juvenile criminals who prowl around the streets. The death-rate of Berlin is one of the highest among the large cities of Europe.

— The *Neurological review* (Chicago, *Rand, McNally & Co.*) is the title of a new monthly to be devoted to original articles, as well as a review of the recent literature in this field of medical and psychological science. The largely increased number of periodicals devoted to these and allied subjects of late, is a strong evidence of the greatly increased activity in researches pertaining to the mental and nervous functions in America as well as in Europe. The present review appears to be well edited by Dr. J. S. Jewell.

— 'Lanolin' is the name given to a substance which is being extensively recommended as a basis for ointments. It possesses properties which are not found in any other variety of fat. In 1868 Hartman and Schultze found that the fatty acids of sheep's wool were in combination with cholesterine. Such a fat will take up one hundred per cent of water, and will not readily decompose. Ordinarily the neutral glycerine fats and vaseline have been used as the bases of ointments. Fatty ointments by their decomposition form irritating substances, and thus tend to injure the skin. Vaseline is not readily absorbed. Lanolin appears to be free from both these objections, and will doubtless come into general use.

— Dr. Wooster Beach, in the *Medical record* for July 24, discusses the proper mode of infliction of the death penalty. He states that the autopsies of those who have been hung show that in not over five per cent is either dislocation, fracture, or any injury to the spinal cord observed. He thinks that any of the following methods could, with advantage, be substituted for hanging. The condemned man should be firmly secured, and a vital part should be struck by a ball from a rifle which had previously been sighted and secured fast; or electricity might be employed. The recent improvements in the apparatus for generating electricity make this method of causing death much surer than it formerly would have been. Dr. W. A. Hammond thinks that the usual apparatus of traps and weights should be dispensed with, and that the body of the criminal should be drawn up slowly by a rope around his neck. Death would be speedy, certain, and painless. Dr. N. E. Brill criticised, some months ago, the present methods of hanging, and as a result a committee of the Society of medical jurisprudence of New York drew up a bill and submitted it to the legislature, in which the condemned was permitted to select the method by which his life should be taken. This bill failed of passage. In Germany decapitation is done with the sword, in France with the guillotine, and in Spain by the garotte. Poisoning by carbonic-acid gas, chloroform, and hydrocyanic acid has also been suggested as substitutes for hanging.

— A study of ten thousand physicians' prescriptions has recently been made by the editor of the *Chemist and druggist*. Spirits of chloroform, glycerine, and sirup of orange-peel, are the most frequently prescribed; then come bromide of potash, wine of ipecac, sulphate of quinine, bicarbonate of soda, liquor ammoniae acetatis, bicarbonate of potash, and sweet spirits of nitre.

— The commercial exportations of France during the year 1884, we learn from the *Revue scientifique*, amounted in total value to $843,400,000, an increase of only about $65,000 over that of 1869. The largest exportations during this time were in the years 1873, 1875, and 1882, when they were more than $100,000,000 greater. Of the exportation in 1884, about $200,000,000 went to England, $83,000,000 to the United States, $103,000,000 to Belgium, $75,000,000 to Germany,

$61,000,000 to Switzerland, etc. The exportation to the United States has increased $105,000,000 since 1869, though in 1872 it was somewhat greater, and in 1882 reached a total value of $107,000,000.

— Professor Forbes publishes in the 'Bulletin of the Illinois state laboratory of natural history,' vol. ii. pp. 257–321, an account of the continuation of the interesting studies on the contagious diseases of insects begun by him in 1883. In this account he describes at length a common and highly destructive disease of the European cabbage-worm (Pieris rapae). This disease he believes to be caused by a spherical micrococcus, of which he gives two excellent microphotographs. More complete and conclusive studies were made of a disease of the silkworm, which was apparently that known as jaundice. Of especial interest is the fact that he was able to produce this disease in cabbage-worms by moistening their food with culture-fluids containing the bacteria of this disease derived from silkworms. These experiments seem to us to be of the highest importance. If this or some other bacterium could be used against the cotton-worm, how much more effectual it might be than the poisons which are now used! These are liable to be washed away by the first rain, and will not multiply themselves. Professor Forbes also reports at length on a disease attacking two species of datana in his breeding-cages. This disease he is positive is the well-known *flacherie* of the silkworm.

— One of the most interesting special reports issued in connection with the last census is part i. of the report on 'Social statistics of cities,' by Col. George E. Waring, jun., the sanitary expert, which is now going through the press, and will be ready to be issued Sept. 1. The subject-matter of this volume is confined to the statistics of certain cities in New England and the middle states; and the second part, which is still to appear, will be devoted to the cities in the southern and western states. The method pursued is to give a historical sketch of the town, which is followed by a description of the climate, the drainage, the financial condition, the gas supply, interments, manufactures, parks, reformatories and healing institutions, police, places of amusement, population, public buildings, streets, water-works, and, in fact, complete statistics of the social life in the places described. In many instances, maps are given showing the system of sewerage, the location of places of amusement, parks, libraries, and museums. The sketches of the cities of Boston, New York, and Philadelphia are very elaborate, especially in relation to the subject of sanitary drainage. The second volume will contain a sketch of New Orleans, furnished by Mr. George W. Cable, the novelist. The report complete will contain about 2000 pages.

— The Ophthalmological society of Heidelberg has awarded Professor Helmholtz a gold Graefe medal and the sum of fifty dollars yearly, as the greatest benefiter of science.

— The Commissioner of agriculture has prepared a circular containing rules and regulations for co-operation between the department of agriculture and the authorities of the several states and territories, for the suppression and extirpation of contagious pleuro-pneumonia of cattle. It will be remembered that congress appropriated $100,000, at its last session, to be employed in such manner as the commissioner may think best, to prevent the spread of pleuro-pneumonia.

— The following changes have been made in the personnel of the coast survey since our last issue: Assistants Boyd, Bradford, and Ellicott have been instructed to organize a party to perform field-work on the coast of Maine, and to survey the topography of the north-eastern corner of the state. The steamer Bache, Lieutenant Hawley commanding, is doing the hydrographic work; Messrs. Vinall, Hodgkins, Van Orden, and Gray have taken the field on the re-survey of Long Island Sound; Mr. E. L. Taney, with a topographical party, is at work on the Kill von Kull; Captain C. O. Boutelle is organizing the parties for furnishing points for state surveys. The appropriations for this purpose this year being so limited, only four parties can be put in the field. The constitution of a permanent tide station on Sandy Hook has begun, and will be finished in about two months. It is hoped when this gauge is finished that an uninterrupted series, both winter and summer, extending over a period of 19 years, will be obtained.

— The number of deaths from yellow-fever in Rio de Janeiro for the fifteen years preceding the last was 15,338. The fever first appeared in 1849, and has been continuous since, though much more severe at times. In 1850 the number of deaths of cases treated in the hospitals was twenty-six per cent, in 1870, seventeen per cent, and in 1883, thirty per cent.

— New discoveries of gold in West Australia, where it has hitherto not been known to exist, are causing considerable excitement in that part of the continent. The locality is in the north-western part, four hundred miles from King Sound, in a wild, desolated, and almost impassable region. The gold is found near the surface in alluvium.

— The 'Pacific coast tide tables' for 1887 have been received from the printer by the coast survey. It is a curious fact that these are the most perfect ever yet received, and close examination thus far reveals not a single error or misprint in the entire edition. The 'Atlantic coast tide tables' will be given to the public in about a week. Section xvi. of the topographical survey of the District of Columbia is in the hands of the photo-lithographer. This beautiful sheet covers the country in the vicinity of the picturesque village of Tenallytown, near which the summer house of President Cleveland is located. The chart of Puget Sound, the Gulf of Georgia, Straits of Fuca, etc., in one sheet, will probably be placed in the hands of agents within two weeks. This chart will supply a long felt want to the people of Washington Territory, covering, as it does, all the inland waters from Gray's Harbor, on the Pacific coast, to the Nanaimo coal fields, in British Columbia. Assistant Schott is well advanced with the computation of magnetic observations of the Greely party in the Arctic regions; the computations of Arctic tides from observations made by the same explorer are also well under way.

— The annual exportation of ivory from Africa has of late years been nearly four hundred thousand pounds, about two-thirds of which is obtained from the eastern part of the continent. These figures represent a sum of about four million dollars, and the death of sixty-five thousand elephants.

— The fiftieth anniversary of the founding of South Australia in December, 1836, will be celebrated by an international exposition to be opened on the twentieth of June next at Adelaide. The population of the colony now numbers three hundred and thirteen thousand, but at present it is decreasing rather than increasing.

— Computations from statistics show about one million as the number of blind persons throughout the world, which, estimating the population of the globe at 1,400,000,000, gives about one blind person to every fourteen hundred. In Austria there is one to every 1,785 inhabitants; in Sweden, one to every 1,418; in France one to every 1,191; in Prussia, one to every 1,111; in England, one to every 1,037, etc. The greatest proportion of blind persons is in Egypt, where, in Cairo, there is one among every twenty inhabitants. Australia shows the greatest variation; in New Zealand there is only one to every 3,550 inhabitants, while in Tasmania there is one to every 625. The nation possessing the greatest number of institutes for the blind is Germany with thirty-five; next comes England with sixteen; France with thirteen; Austria-Hungary with ten; Italy with nine; Belgium with six; while according to our authority, the *Deutsche rundschau für geographie und statistik*, America, Asia, and Africa together possess only six. There are two in Australia.

— There are twenty-one cities in the German empire containing each more than one hundred thousand inhabitants.

— The population of New South Wales, according to the census recently taken, is very nearly one million, which is of interest as showing the very rapid growth, forty per cent increase, during the last ten years.

— According to Dr. Tipton of Alabama, in the *Medical journal*, the negroes before the war in the south never had phthisis, but now it is the greatest scourge among them. He also says that the negro is rarely if ever near-sighted.

LETTERS TO THE EDITOR.

***Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The source of the Mississippi.

In June, 1884, the *New York Herald* announced that recent explorations had revealed the true source of the Mississippi River to be, not the lake discovered by Schoolcraft in 1832 and named by him Itasca, but a tributary lake to the south of it, discovered and first explored by a Capt. Willard Glazier in 1881.

In commenting upon this alleged discovery, *Science* says (May 15, 1885): "To this lake he (Glazier) gives his own name, that the fame of his achievement may be perpetuated. It is perhaps unfortunate that, as this whole region was sectionized by the general land office several years previously, lines having been run at every mile, a prior claim to this great discovery may arise."

This comment was thought to be sufficient to impress upon all the absurdity of a claim to have discovered, at this late day, a lake of any considerable size in the region referred to; but as one of our popular school geographies[1] has indorsed the genuineness of this discovery (?) by adopting 'Glazier Lake' as the source of the Mississippi, and as the makers of our school geographies have a bad habit of blindly following each other's lead, it will be well, perhaps, to examine a little more closely Mr. Glazier's claim to such recognition.

In 1806 Lieut. Zebulon Pike, and in 1820 Governor Lewis Cass, penetrated to Red Cedar or Cass Lake: but there is no record of definite explorations beyond this lake earlier than those of Henry R. Schoolcraft, who in 1832, under authority of the war department, led a well-equipped expedition through this region. In his brief official report, dated at Sault Ste. Marie, Sept. 1, 1832, Schoolcraft states that Lieutenant Allen accompanied him as topographer, and that he carefully collected material for maps and plans of the entire route. Upon his return to Detroit, Schoolcraft wrote, in 1833, a full narrative of the expedi-

[1] '*Barnes's complete geography*'. By James Monteith. New York and Chicago, *A. S. Barnes & Co.* Copyright 1885.

tion, which was published by Harpers in 1834, and is accompanied by a map of the region, compiled by Lieutenant Allen. A reduced fac-simile of a portion of this map is here reproduced. From Lac

FIG. 1.—SCHOOLCRAFT'S MAP.—1832.

Travers (Bunidji Lake) the expedition ascended the Plantagenian Fork, 'carried' over a six-mile portage to Lake Owashkos (Elk), which Schoolcraft named *Itasca*, and descended the Itascan Fork, having spent three days in making the circuit.

That Schoolcraft knew of an inlet to Lake Itasca is evident from his map, on which an inlet leading from a smaller lake to the south is indicated, but in addition to this he says on p. 58 of his 'Narrative:' "The outlet of Itasca Lake is perhaps ten to twelve feet broad, with an apparent depth of twelve to eighteen inches. The discharge of water appears to be copious, *compared to its inlet*."

It may be asserted that Schoolcraft knew of an inlet only from visiting its mouth, but that he neglected to ascend and explore it, and that his knowledge of the existence of the small lake from which it leads was gathered from his Indian guide—or was entirely hypothetical. Although this is unlikely, owing to the object of the expedition and to the fact that the map does not show other and larger lakes which were not visited, still, as no mention of this small lake is made in the narrative, let this view of the case be conceded, and let us pass to the next explorer.

Four years later, in 1836, Mr. J. N. Nicollet visited and made an instrumental exploration of this region. The results of his explorations he incorporated in a report and map published by the U. S. bureau of topographical engineers, as 'Senate document No. 237, 26th congress, 2nd session, 1843.' A reduced fac-simile of a portion of this map is here reproduced.

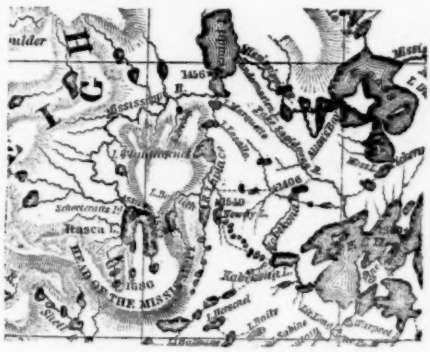

FIG. 2.—NICOLLET'S MAP.—1843.

From his report we learn that Nicollet approached Itasca via Leech Lake and Kabekona lake and river; his route joining Schoolcraft's near the mouth of the Naiwa River—on the Plantagenian Fork, which Nicollet named La Place River. Arrived at Itasca, his report proceeds (pp. 57-59): "The Mississippi holds its own from its very origin; for it is not necessary to suppose . . . that Lake Itasca may be supplied with invisible sources. . . . There are five creeks that fall into it, formed by innumerable streamlets oozing from the clay beds at the bases of the hills . . . known here by the name of 'heights of land.' South of Lake Itasca, they (the heights of land) form a semicircular region with a boggy bottom, extending to the south-west a distance of several miles. . . . The waters supplied by the north flank of these heights of land . . . give origin to the five creeks of which I have spoken above. These are the waters which I consider to be the utmost sources of the Mississippi.

"Now, of the five creeks that empty into Itasca Lake, . . . one empties into the east bay of the lake, the four others into the west bay. I *visited the whole of them*; and among the latter there is one remarkable above the others, inasmuch as its course is longer, and its waters more abundant; so that, in obedience to the geographical rule 'that the sources of a river are those which are most distant from its mouth,' this creek is truly the infant Mississippi. . . . The day on which I explored this principal creek (August 29th, 1836) I judged that, at its entrance into Itasca Lake, its bed was from 15 to 20 feet wide, and the depth of water from 2 to 3 feet. . . . As a further description of these head-waters, I may add that they unite at a small distance from the hills wherein they originate, and form a small lake from which the Mississippi flows with a breadth of a foot and a half and a depth of one foot. At no great distance, however, this rivulet . . . supplies a second minor lake. . . . From this lake issues a rivulet . . . into the basin of a third lake somewhat larger than the two preceding. Having here acquired renewed vigor, and tried its consequence

upon an additional length of two or three miles, it finally empties into Lake Itasca. . . . After having devoted three days to an exploration of the sources of the Mississippi, and spent portions of the nights in making astronomical observations, I took leave of Itasca Lake, to the examination of which the expedition that preceded me by four years had devoted but a short time. . . .

"The honor of having first explored the sources of the Mississippi and of introducing a knowledge of them into physical geography, belongs to Mr. Schoolcraft and Lieutenant Allen. I come only after these gentlemen; but I may be permitted to claim some merit for having completed what was wanting for a full geographical account of these sources. Moreover, I am, I believe, the first traveller who has carried with him astronomical instruments, and put them to profitable account along the whole course of the Mississippi from its mouth to its sources."

In the table on pp. 124 and 125 are to be found Nicollet's determination of the geodetic position and elevation of this region — among others Lake Itasca (Schoolcraft's Island) 47° 13′ 35″ north latitude, 95° 2′ west longitude, and 1,575 feet above the Gulf of Mexico — and the "utmost sources of the Mississippi, at the summit of the height of land, six miles south of Lake Itasca — elevation 1,680 feet above the Gulf."

Nicollet, therefore, fully explored, recorded, and mapped all the inlets to Lake Itasca, found that these inlets, or some of them, came from lakes or lakelets; and, recognizing that the source of a river is the one most distant from its mouth, considered none of the tributary lakelets he had explored as sufficiently important to even merit a name. In addition to this he distinctly states that "the honor of first exploring the sources of the Mississippi belongs to Messrs. Schoolcraft and Allen."

But it may be urged, that opinions may differ as to the relative importance of the Itascan lakes; that the smaller tributary lake, though discovered and explored in 1836, was not then named; and as it is nearer than Lake Itasca to the ultimate head spring of the Mississippi, it was fair game for the traveller who should reach it and affix a name to it. This, though again an extreme view, may be again conceded.

I am unable to give the exact date at which the township including the immediate vicinage of Lake Itasca was surveyed and subdivided into one-mile sections; but it is marked, by the little cross, as having been so subdivided, on the land office map of Minnesota, issued in 1879 — or two years before Mr. Glazier's trip. A tracing from this map is reproduced here, and on it is shown not only a small lake south of and tributary to Lake Itasca, but a name, 'Elk Lake,' is affixed to this lake. Probably the surveyors in sectionizing this region, remembering the old Indian name, 'Owoshkos,' of the lake which Schoolcraft called Itasca, thought to preserve it by affixing its English equivalent to the small tributary lake to the south. A further inspection of the land-office map proves the integrity of its makers. East of Lake Itasca is an area not crossed by township lines; it had not been surveyed by the land-office at the time this map was made, and consequently all topographical features, streams, and lakes, were omitted. Thus only part of the east, or Plantagenian, branch of the Mississippi is shown, though the existence and course of the river was well known; and on other government maps, as, for instance, the post route maps for 1876 — the whole course of this branch is indicated. And now, having seen that the small lake south of and tributary to Lake Itasca was mapped by Schoolcraft in 1832; fully explored and mapped by Nicollet in 1836; and surveyed, mapped, and named by the land office prior to 1879 — what remains to justify Mr. Glazier's claim to discovery in 1881?

His own detailed account of his trip entitled the 'Recent discovery of the true source of the Mississippi, By Captain Willard Glazier,' was published in vol. 1 of the *American meteorological journal* (Detroit, 1884), and was illustrated by a map of the region 'drawn from delineations by his Indian guide.' A portion of this map is here reproduced for comparison with the others.

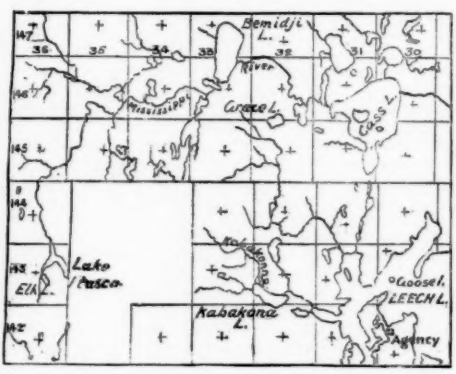

Fig. 3. — Land-office map. — 1879.

Fig. 4. — Glazier's map. — 1881.

Certain passages of Glazier's account reveal a striking similarity in observation, incident, and phraseology when placed in parallel columns and compared with passages from Schoolcraft's 'Narrative' (editions of 1834 and 1855):

Schoolcraft, 1832.	*Glazier*, 1881.
Naiwa River.	**Naiwa River.**
(p. 238.) "On questioning Ozawindeb (the guide) of the Naiwa River, he informed me that . . . it originated in a lake . . . infested with the copperhead snake; hence the name."	(p. 258.) "Che-no-wa-ge-sic explained that Naiwa was a stream . . . having its origin in a lake . . . infested with snakes, to which its name has reference."
Assawa Lake	**Assawa Lake (Elvira).**
(p. 239.) "We were just twenty minutes in passing through it. . . . our course . . . was directly south. Ozawindeb entered an inlet, but had not ascended it far when he rested on his paddles and exclaimed 'Oomah-mekunnah,' here is the path, or portage. . . . The water was tepid. After wading about fifty yards the footing became more firm, and we soon began to ascend a slight elevation . . . where vestiges of the bones of birds and old camp poles indicated the prior encampment of Indians. The next morning a dense fog prevailed. . . . It was five o'clock before we could proceed."	(p. 259.) "We were twenty minutes in passing through the lake. On reaching its southern end we entered one of the brooks. . . . Che-no-wa-ge-sic soon pushed his canoe into the rushes and exclaimed 'Oma-mikunna,' here is the portage. We stepped into rather warm pond water . . . After wading about a hundred yards or more the soil became firm, and we began to ascend a slight elevation . . . Remains of former fires, the bones of birds, and scattered camp poles proved it to be a spot which had previously been occupied by the Indians. . . . A dense fog . . . prevented our getting upon the trail until seven o'clock in the morning."
Lake Itasca	**Lake Glazier (!)**
(p. 241.) "Soon out went him on the trail, and got the first glimpse of the glittering nymph we had been pursuing."	(p. 265.) "In their eagerness to get a first glimpse of the glittering nymph we had been pursuing."

Glazier states (p. 327) that Lake Glazier is in latitude 47° 13′ 25″ north; is 1,578 feet above sea level; and distant from the sea 3,184 miles. Schoolcraft states in his first edition (1834, p. 58) that Lake Itasca is 3,160 miles from the sea, and in his revised edition (1855, pp. 243 and 245) he inserts Nicollet's determinations of its latitude, 47° 13′ 35″ North, and its elevation, 1,575 feet. With the exception of the figures, Glazier's language is word for word that of Schoolcraft.

On p. 328 of Glazier's account is found an *addendum* entitled 'Meteorological observations at the head-waters of the Mississippi,' consisting of a record of daily temperature from July 17 to Aug. 2 (July 17 is the date at which Glazier says, p. 252, he started from Leech Lake). Now reference to p. 423 of Schoolcraft's 'Narrative' (edition of 1855) reveals the fact that this meteorological table is an exact copy, word for word and figure for figure, of observations taken between the days named, in the year 1820, by Schoolcraft in the vicinity of Cass Lake!

This liberal use of the statistical information gathered by others; i.e., a subtraction of ten seconds from Nicollet's observation of the latitude, and an addition of three feet to his barometrical determination of the elevation of Lake Itasca; and the exact copy of Schoolcraft's meteorological observations at Cass Lake, — afford strong evidence, in the absence of any direct statement to the contrary, that Mr. Glazier took no scientific instruments with him, such as thermometer, barometer, and sextant or solar-compass, and that he simply made a guess at the latitude and elevation of the lake with which he desires to associate his name. That his guess was a grossly inaccurate one is curiously proved by his own account. He says (p. 262): "Itasca is . . . between five and six miles in length, and from one-fourth to three-fourths of a mile in width. It has three arms, — one to the south-east, three miles long; one extending south-west from the island; and one reaching northwards to the outlet, two and one-half miles."

Now Nicollet's determination of the latitude of Itasca is of *the island* in the lake (Schoolcraft's Island), and is 47° 13′ 35″; while Glazier says (p. 327) that Glazier Lake (exact locality not noted) is in latitude 47° 13′ 25″, or just ten seconds of arc south of Schoolcraft's Island. The degree of latitude between 46° 30′ and 47° 30′ is 69.079 miles long (Coast survey report, 1884). As ten seconds is $\frac{1}{360}$th part of this distance, or 1,013¼ feet, the position of Glazier Lake, as given by Mr. Glazier, is actually *within* Lake Itasca.

RUSSELL HINMAN.

Copper River, Alaska, glacial action.

For the study of the action of water in its relation to geological changes, American students have always found an ample field at home; not so, however, with respect to glacial action, for we find our most exhaustive treatise on this subject (Shaler's) confined almost exclusively to the Alps glaciers. Let specialists in the future seek fields in our own province, where the system is probably more extensive than in any other country south of the arctic circle. I refer to that portion of the territory from Chilcat inlet up to Cook's inlet, and in especial to that portion drained by the Copper River.

How far glacial action has been concerned in the determination of the topography will long be a subject for study.

My observations were such as to cause a belief in an ice sheet that one time extended from the Alaskan Mountains to the coast; as to how much farther from the north it came I have nothing to say. It may at first be considered at variance with the theory of contemporary upheaval of this part of the territory with the ranges of the western part of the United States. If the glacial period be considered long subsequent to the upheaval, there need be no difficulty in reconciling the above. It was the ice sea, which, by its steady motion to the south, has largely assisted in giving the country its present configuration.

From Yakutat Bay to the mouth of Copper River is an unbroken face of ice extending a distance of fifty miles. How far this reaches to the interior through the gorges of the coast is unknown, though it may be safe to consider the distance equal to that of the glaciers of Copper River from its mouth. These latter may be considered an extension of the ice fronting the coast, — including the above-mentioned fifty miles, — which has been cut through by the river. There is every reason to believe that Miles's and Child's glaciers were formerly one and the same, — an opinion that is in some way strengthened by the traditions of the natives. The most southerly point of the former on the left is one mile or less from the most northerly point of the latter on the right bank; while in the river bed between are well-worn bowlders eight to twelve feet in diameter.

Furthermore, on the left bank below Miles's glacier, and opposite Child's, is an enormous glacial drift now covered with vegetation. Where this is joined to Miles's it is impossible to distinguish the drift from the glacier.

The flow of these is now from east to west for those on the left bank, and from west to east for those on the right bank; yet this is not the general course the masses had when much larger than at present. They are at present but a residuum of the once extensive ice fields now discharging along the paths of least resistance. Had not the climate here been moist and in other respects favorable for glacier making, the present site would have been occupied by only drift or moraine. Farther north, above the Chittyná on the east bank of the Copper, are for many miles terraces large and small. The smaller ones are so regularly formed as to leave the impression that they were the fronts of old fortifications.

In Blake's 'Stickeen River,' he makes mention of the scarcity of well-defined terraces, while Dall also failed to observe any in the vicinity of Sitka and the Alaska Peninsula.

I can only account for the remarkable width of the bed of the Copper by the supposition that it was excavated by the power of gigantic ice masses assisted by the eroding effects of the torrent waters from them. The volume of water in proportion to the width of bed is less than in any river within my knowledge, yet the banks, as a rule, are high and rather steep. The sources of the Copper and its principal tributary, the Chittyná, are glaciers, though small in comparison with those above mentioned.

By an examination of the map it will be seen that the Alaskan Mountains form an arc convex to the northward; hence the lines of least resistance of ice masses in moving from these mountains to the southward, tended to intersect in the present Copper valley. The result was the enormous power producing the remarkable excavations cited above.

I earnestly hope that glacial action in this district will receive early attention at the hands of competent men. A simple inspection of the maps of Alaska, however deficient in detail they are, by a student of nature will show that this locality was the scene of most powerful action, the traces of which are correspondingly clearly preserved.

North of the Alaskan Mountains I failed to observe any of these remarkable glacial phenomena, though from reports of miners they may be found in the White River region.

HENRY T. ALLEN.

Fort Walla Walla, Washington Ter., Aug. 1.

The significance of coincident weather-conditions.

In your criticism (Aug. 6) upon my article entitled, 'The significance of coincident weather-conditions,' you intimate that I have not given proper heed to 'dissimilar weather.' It did not seem to me necessary to dwell at length upon that phase of the subject in order to make my meaning plain. But inasmuch as there seems to be an entire misunderstanding, I will now say that any theory that demands, for instance, that a typhoon shall occur in New York state is manifestly absurd. The influence of oceans, and continents, and of mountain ranges, and the like, must be taken into the account. In certain latitudes storms have a well-defined character at certain seasons of the year. Thus, dissimilarity of weather conditions in different localities is readily accounted for. There are times, however, when great storms occur almost simultaneously in every quarter of the globe. My point is that such an event affords an opportunity to test the theory that there is a direct relation of some sort between disturbances on the sun and storms on the earth. If this relation does exist, the sun should be disturbed in proportion to the magnitude of these exceptional atmospheric movements on the earth. That this was the case during the storms in May, the records of the condition of the sun then made will show (see *Nature* for July 22, p. 278). Also consult any records accessible in regard to the terrestrial and solar conditions existing on March 31, 1886. It would manifestly be unsafe to generalize on the basis of one or two such cases. But when numerous instances of this sort have been recorded, it would seem quite proper to call attention to the matter, as constituting one item of information in regard to a great and complex subject about which confessedly but little is known. In the words of my article, "the truth of the theory that the condition of the sun modifies the weather on the earth can be tested by considering the case of great storms that prevail widely."

M. A. VEEDER.

Lyons, N. Y., Aug. 7.

Poisoning by ice-cream.

No chemist certainly would suppose that the same poison exists in all samples of ice-cream which have produced untoward symptoms in man. Mineral poisons, copper, lead, arsenic, and mercury, have all been found in ice cream. In some instances these have been used with criminal intent. In other cases their presence has been accidental. Likewise, that vanilla is sometimes the bearer, at least, of the poison, is well known to all chemists. Dr. Bartley's idea that the poisonous properties of the cream which he examined were due to putrid gelatine is certainly a rational theory. The poisonous principle might in this case arise from the decomposition of the gelatine; or with the gelatine there may be introduced into the milk a ferment, by the growth of which a poison is produced.

But in the cream which I examined, none of the above sources of the poisoning existed. There were no mineral poisons present. No gelatine of any kind had been used in making the cream. The vanilla used was shown to be not poisonous. This showing was made, not by a chemical analysis, which might not have been conclusive, but Mr. Novie and I drank of the vanilla extract which was used, and no ill results followed. Still, from this cream we isolated the same poison which I had before found in poisonous cheese (*Zeitschrift für physiologische chemie*, x, heft 2), and demonstrated its poisonous properties by experiments upon cats. Moreover, by adding a piece of the solid portion of the poisonous cream, about the size of a filbert, to some normal milk, and making cream with this milk, following the details of the maker of the Lawton cream, omitting, however, all flavoring, I obtained a highly poisonous cream. Does this not prove that the poison may be produced by fermentation in good milk? A detailed account of my experiments may be found in my report to the Michigan state board of health.

V. C. VAUGHAN.

Ann Arbor, August 9.

Recent Proceedings of Societies.

Academy of natural sciences, Philadelphia.

Aug. 3. — Dr. George H. Horn exhibited a fragment of the wood of a palm, Washingtonia filifera, containing a larva of the rare beetle, Dinapate, recently described by him from fragmentary specimens. The wood shows the ravages inflicted on this tree by the insect referred to. He had received a section of a trunk about three feet long, which he proposed presenting to the botanical department of the Academy, after it had yielded up whatever insect life it might contain. —— Mr. Meehan explained that the tree palm was of interest as being the only one on the western coast which had been introduced from Mexico. The botanical history of the form was given. —— Mr. Lewis Woolman recorded the discovery by him of a belt of Oriskany sandstone in the neighborhood of Pennsville, Lycoming county, Pennsylvania. No mention of its occurrence in the locality named can be found in the State geological reports, and the official surveyors were evidently unaware of its existence. The speaker had traced the rock for about a mile, although it does not here form a ridge as it does elsewhere. In the neighborhood of Pennsville ample evidence of the existence of the rock, in the shape of building material, may be found. Among the evidences of fossil remains imbedded in the rock masses exhibited at the meeting were Spirifer arenoides, Spirifer arrectus, and Rensellaeria ovoides. —— Professor Heilprin corroborated the identification of the fossils, and stated that they undoubtedly indicated the Oriskany sandstone. In view of the discovery by Mr. Woolman, the importance of paleontological evidence in determining the age of geological formations was insisted on. —— Mr. Meehan called attention to a photograph, recently received from Dr. Schaeffer, of Pottsville, of a tree growing on the side of a hill. It illustrates the fact that after a tree has grown in an oblique direction for years, it may then gradually become erect. Such growth was described by Professor Vesey in 1884, and attracted some attention. —— A paper entitled 'History and biology of pear blight,' by J. C. Arthur, was presented for publication in the proceedings.

Publications received at Editor's Office, Aug. 2-7.

American association for the advancement of science, proceedings of the meeting at Ann Arbor, Mich., 1885. Salem, *The association*, 1886. 95+567 p. 8°.

Amherst college. Twenty-fifth annual report of the professor of physical education and hygiene, 1886. Amherst, Mass., *The college*, 1886. 16 p. 8°.

Besalenque, D. Arte del idioma Tarasca. México, *Secretaría de fomento*, 1886. 32+86 p. 4°. (New York, Christern, $4.)

Duffy, T. Wave motor. San Francisco, *Francis*, 1886. 15 p., illustr. 8°.

Hennessy, H. On the fluid state of bodies composing our planetary system. Dublin, *Roy. Irish acad.*, 1886. [4] p., illustr. 8°.

Hughes, C. H. Meconeuropathia. St. Louis, *Alienist and neurologist*, 1886. 15 p. 8°.

James, C. La rage, avantages de son traitement par la méthode Pasteur. Paris, *Lahure*, 1886. 124 p., illustr. 8°. (New York, Christern, 70 cts.)

Langlois, A. L'association, la vie domestique et l'école. Paris, *Baillière*, 1886. 154 p. 16°. (New York, Christern, 50 cts.)

Leclercq, J. La terre des merveilles. Paris, *Hachette*, 1886. 384 p., maps, illustr. 12°.

Pitkin, L. Theories concerning the protective influence of mitigated virus. New York, *Acad. of sc.*, 1886. 10 p. 8°.

Rincon, A. del. Grammática y vocabulario Mexicanos. México, *Secretaría de fomento*, 1885. 94 p. 4°. (New York, Christern, $4.)

Rosny, L. de. Les Antilles. Paris, *Soc. d'ethnogr.*, 1886. 152 p. 4°. (New York, Christern, $3.35.)

Schmitt, J. Microbes et maladies. Paris, *Baillière*, 1886. 10+296 p., illustr. 16°. (New York, Christern. $1.20.)

Sidgwick, H. Outlines of the history of ethics. New York, *Macmillan*, 1886. 24+276 p. 8°. $1.50.

U. S. department of agriculture. Second annual report of the bureau of animal industry, 1885. Washington, *Government*, 1886. 662 p., maps, illustr. 8°.

Vines, S. H. Physiologie of plants. Cambridge, *University press*, 1886. 10+710 p., illustr. 8°. (New York, Macmillan, $5.)

SCIENCE.—SUPPLEMENT.

FRIDAY, AUGUST 13, 1886.

MEDICINE IN THE UNITED STATES, AND ITS RELATIONS TO CO-OPERATIVE INVESTIGATION.[1]

I PROPOSE to call your attention briefly to some points relating to the present condition and future prospects of medicine in the United States, and to the direction in which you may reasonably hope and expect from that country in the future the most useful co-operation in the improvement of medical science and art. I believe that these must be matters of interest to you, and that I can perhaps make clear certain peculiarities which do not seem to be as generally understood on this side of the Atlantic as it is desirable that they should be to insure sound judgment upon some of the results observed.

In the first place, permit me to call your attention to the fact that it is hardly possible to make any statements with regard to medicine in, or the medical profession of, the United States as a whole, which shall be definite and at the same time distinctive; that is, which will not apply almost equally well to medicine and the medical profession in other countries. This is due to the fact that there are great differences in the organization of the profession in different parts of America, so that what is true of one state would not be true of another; what is required as to fitness or qualification to practise in one place is not required in another; and the country covers so many parallels of latitude and meridians of longitude, making the conditions of life so diverse, and producing such differences in the prevailing diseases, that a man who is fairly qualified to practise in one section may be poorly fitted to treat the endemic diseases of another.

Let us begin by considering some of the things that American physicians complain about; in other words, some of their supposed grievances. One of these is that the profession is overcrowded; that there are too many doctors, both *in esse* and *in posse*, and that this is due to too low a standard of education, and to the want of legal restrictions as to the qualifications which shall give a man the right to practise. Statistics gathered in 1883,[2] showed that in the United States and Canada there were 90,410 persons calling themselves physicians, being in the proportion of 1 to every 600 of population. In Canada alone, there were 3487 physicians, or 1 to 1112 of population. If we take the figures of our last census, of 1880, the proportion of physicians reported, is 1 to 589 of population, or 17 per 10,000. In England and Wales, by the census of 1881, the proportion of physicians is only 5.8 per 10,000, but these figures are not properly comparable with those of the United States, because they do not include unregistered persons. If the same classes were included that are counted in the United States report, I presume that the proportion would be about 9 per 10,000, or a little more than half that in the United States.

In the United State the proportion to the population of those who call themselves physicians varies greatly in different localities; thus, in Colorado there are 29.3, in Indiana 25.2, in Oregon 24.3, and in Arkansas 23.5 per 10,000; while in New Mexico there are only 6.6, in South Carolina 9.2 and in North Carolina 9.7 per 10,000.

It is not easy to give satisfactory reasons for these differences; we can only say that they do not depend to any great extent upon local legislation. The proportion of physicians is generally lowest in the southern states lying east of the Mississippi, and highest in those regions where immigration has recently been active. If we compare, by localities, the proportion of physicians to the population with that of clergymen and lawyers, we find some curious differences. It seems that the lawyers in the United States number 12.7, while in England and Wales they are 6.6 per 10,000, but that on the other hand the clergymen are 14.6 in England and 12.8 in the United States per 10,000 of population. In many instances it seems that where the lawyers are most numerous the supply of clergymen is smallest. I believe that a fair proportion of physicians to population is about 1 per 1000, which is not far from the actual proportion in England, while the true proportion of practising physicians in the United States is about 1 in 750. We must admit, then, that there is at all events no scarcity of physicians in the United States, and, as we have over 80 medical schools at work, besides a fair proportion of medical immigrants, there is no immediate danger of any interruption to the supply.

[1] Condensed from the annual address in medicine delivered before the British medical association, Wednesday, August 11, 1886, by JOHN S. BILLINGS, surgeon U. S. A.

[2] Illinois state board of health report, 1884.

Let us now consider the second head of the complaint, viz., that the standard of education is too low. There is ground for this, considered with reference to some localities, but not for others. I said a moment ago that a man might be fairly qualified for practice in one part of the country and yet find himself at a loss in another. This needs a little explanation, which I can, perhaps, give most easily in connection with a map of the United States (chart i.). This map, which was prepared for a very different purpose, indicates by different shades of color, the relative proportion of deaths reported as due to malarial disease to the total number of deaths in different parts of the country, for the census-year 1879–80. You will note how comparatively light the tint is in the north and north-east, and how dark the shades become in the south and in the valley of the Mississippi, thus indicating the great differences which exist as to the prevalence and deadly effects of the malarial poison in different sections of the country.

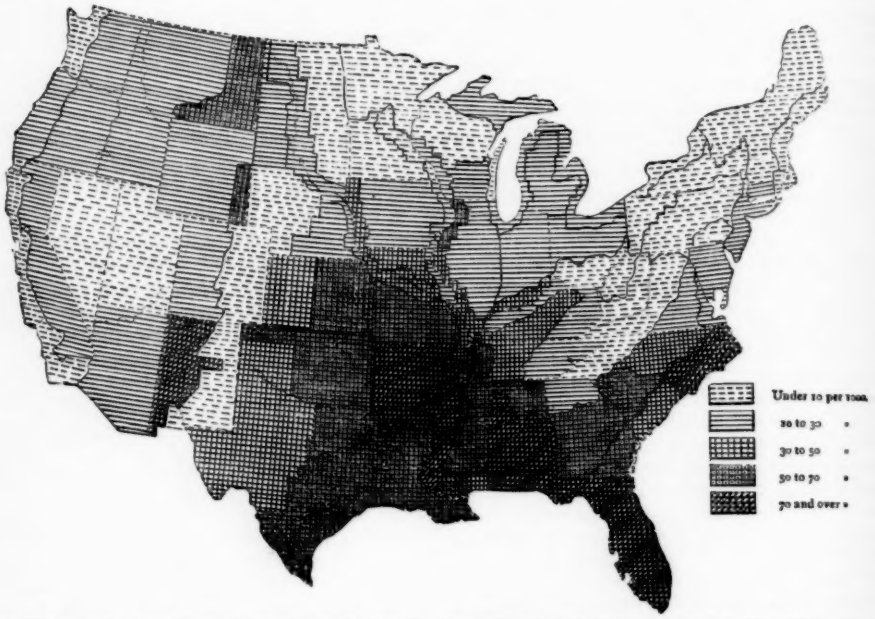

CHART I.—SHOWING THE DISTRIBUTION OF DEATHS FROM MALARIAL FEVER AS COMPARED WITH DEATHS FROM KNOWN CAUSES.

As compared with the north and east, much of this malarious region is a thinly settled country, an almost purely agricultural country, and not a rich country. I need hardly tell you that the physician who has received his chief clinical instruction in the office of his preceptor in Vermont or New Hampshire, supplemented by distant glimpses of a few cases in hospital in Boston or New York, will find himself at a loss at first in dealing with the emergencies of daily practice in Arkansas and Mississippi. He will be subjected to influences which at times are dangerous to one who is not acclimated, and which tend to produce depression of spirits, want of energy, and bad health. He will not have free and constant access to scientific companionship, nor be stimulated by the influence of learned societies, and he cannot avail himself of the ordinary sources of amusement, education, and rest, such as art galleries, the drama, libraries, and museums, etc., which are found in the large cities. Moreover, the pecuniary reward which the practitioner in many of these places can reasonably hope for is comparatively small.

Nor can the inducements for highly educated physicians to settle in thinly settled localities be made stronger by any form of penal or restrictive legislation. Any attempt to fix a standard of requirements or qualifications for practice which shall be the same for such rural districts and for the large cities and manufacturing towns, must result in the adoption of what competent

judges would consider so low a standard as to be ridiculous and useless. The demands are widely different, and corresponding differences exist in the sources of supply, that is, in the medical schools.

There is a class of medical schools in the United States whose object is to give the minimum amount of instruction which will enable a man to commence the practice of medicine without much danger of making such serious and glaring blunders as will be readily detected by the public. There are other schools whose aim and object is to make fairly well trained practitioners; the general character of the instruction given in these being substantially the same as that given in your English hospital schools. The results of such a three-years' graded course of instruction in medicine as these schools furnish, depend upon the character of the material upon which they work; that is to say, upon the general preliminary education possessed by the student at the time of his matriculation. This is evidently too often defective, and only a few schools have thus far ventured to establish any standard of preliminary examination which at all approaches in its demands that which is required in England.

As a rule, the efforts which have been made to secure legislation upon medical matters in America have come from the profession itself and have been chiefly urged and recommended by physicians. The general public, and even the educated public, has shown very little interest in the matter. It does not demand protection against ignorance, but entrusts the care of its health and the lives of those who are nearest and dearest to it to almost any one who announces himself as prepared to take charge of them. The number of those who profess to practise medicine in the United States and are not qualified to do so is undoubtedly large, though by no means so large as one might suppose after listening to the impassioned eloquence which is duly aired every year upon the subject. There are some advertising charlatans, and travelling quacks are occasionally to be met with, but they are rare.

But what evidence have we as to the results upon the health and life of the people? What shall we take as the measure of the difference of skill in physicians? The death-rate? If we compare the death-rate of the United States with those of other civilized countries, we find that it is as low as any with the exception of Sweden. Does a low death-rate mean better sanitary condition, or more skill among the doctors? For the last twenty years the death-rate has been diminishing in England; the average amount of life for each person here has been increased, but I observe that the sanitarians claim this as proof of the value and importance of their efforts, and that nothing is said about its being in any way due to increase in medical skill or to improvements in medical science. Evidently this test is not a convincing one. Almost the only matter in which figures seem to demonstrate the importance of superior medical education and skill is in the statistics of deaths due to childbirth and of the results of surgical operations.

The proportion of deaths from childbirth to the number of births is decidedly greater in the rural districts than in large cities, and among the colored than among the white population. Similar differences are found in England, and are undoubtedly due to the better treatment afforded in the cities by the surgeons and hospitals.

Now, seeing that really efficacious legislation with regard to medical education or to the practice of medicine must, like all efficacious legislation, be substantially in accord with public opinion, since it is impossible to continue to punish for any length of time that which public opinion does not condemn; and as the great mass of the people of the United States have not as yet had such evidence as they can understand, and which would thoroughly convince them that it is to their interest to suppress quackery, it follows that it is necessary to go slowly and to allow such evidence to accumulate.

To me it seems that the most important of the first steps to be taken in this direction is one which has already been taken in Great Britain — namely, the requirement that every death in the community shall be registered, and that in such registration satisfactory evidence shall be given as to the cause of death, sufficient at least to prove that such cause is what is known as a natural cause, that is, that it is not due to crime. When it is admitted that one of the duties of government is to provide for such registration, it follows, necessarily, that those persons whose certificates as to the cause of death are to be accepted must present evidence that they are properly qualified to make such certificates.

So far as the art of medicine is concerned, the demand has much, though by no means all, to do with regulating the quantity and quality of the supply; and there are few localities in the United States where the qualifications of the medical man are not fully up to the standard which the community is able to appreciate and is willing to pay for. The laws regulating the practice of medicine in the United States are all state laws. Of the various methods which have been tried in different states to insure by law that physicians shall be properly qualified, I will call your attention to two which are of special interest.

The first is that of Alabama, the principle of which is to organize the whole medical profession of the state, and use it as the means of regulating the qualifications of practitioners and of caring for the public health. The Medical society of the state of Alabama, with its branches, the county medical societies, thus forms a part of the machinery of the government; it appoints boards of medical examiners, selects state and county sanitary officials, supervises the registration of vital statistics, the administration of quarantine, etc., — in short, it is the state board of health, and the county branches are the county boards of health. This system has now been in operation nine years, and has gradually been consolidated and improved by educating local boards, and getting all physicians interested in it, until it is now working fairly well.

The second system to which I will call your attention, is that of the state of Illinois, which was commenced in 1877, or about the same time as that of Alabama.

In Illinois any one who presents a diploma, or license to practise, from a legally chartered medical institution in good standing, is entitled to practise, and the state board of health is to decide as to what shall constitute 'good standing.' The board of health also examines all persons who do not possess satisfactory diplomas, and who nevertheless wish to practise in this state.

One of the greatest practical difficulties in the way of providing any system of state examinations in medicine in the United States, is that public opinion will not support any law which can be supposed to condemn or in any way to injure homoeopathic and eclectic practitioners or their schools, and hence any proposed law relating to medicine, or to the organization of state boards of health, which does not recognize the existence of these sects, will in many states, at all events, meet with enough opposition to defeat it. In Illinois this difficulty was surmounted by the arrangement, that of the five physicians on the board, one should be homoeopathic and one eclectic. The Kansas law, passed last year, goes further in this direction, and provides that appointments must be so made that no school of medicine shall ever furnish a majority of the members of the board. Much to the surprise of many, the Illinois plan has worked very well — there has been no quarreling in the board — and the homoeopathic and eclectic members seem to have upheld quite as high a standard of qualification as their fellow members. The results of the work in Illinois have been very good. A large number of ignorant charlatans were forced to leave the state. The requirements of the board as to what shall constitute a medical college in good standing, have been raised, and it has thus caused improvement in the medical schools, not only of Illinois, but of other states. Moreover, the neighboring states have been stimulated to action, not only by the force of example, but because they received the men who had been driven out of Illinois, and found the accession an unpleasant one.

The relations of the general government to medical education are indirect, but they have of late years become of very considerable practical importance, and are now exerting much influence upon medical investigations and literature. This is effected by the museums and libraries which are now being formed under the auspices of the government at Washington, and also, to some extent, by certain special investigations undertaken by the government in the interests of preventive medicine. Of these various agencies one of the most important is the library which has been formed at Washington, under the auspices of the medical department of the army in connection with the Army medical museum.

As regards investigations into the causes of disease, undertaken at the expense of the general government, only a beginning has as yet been made; but it is sufficient to indicate future possibilities and probabilities. The main importance of the work of the National board of health, which was organized in 1879 under the stimulus of the great yellow-fever epidemic of the previous year, was due to investigations upon the causes of yellow-fever and diphtheria, the relations of soils and of water-supply to certain diseases, etc. Similar investigations have been undertaken by state boards of health, and especially by the state board of health of Massachusetts, and the fact that governmental health departments are tending to work in this direction is significant as to future co-operation from such sources.

In this connection should be mentioned the National museum of hygiene, which has been formed under the direction of the medical department of the United States navy, which is now one of the most instructive collections of the kind in the world, and has also connected with it an excellent library and a well-equipped laboratory.

Comparative and experimental pathology is also receiving attention from the government under the direction of the department of agriculture, which is doing some good work in the investigation of the diseases of our domestic animals.

As to the condition of medical science and art in America, it partakes of the general progress, for the press now makes all discoveries the common property of the civilized world. The marked feature of the present epoch is the recent advance in

knowledge as to the relations between micro-organisms and certain diseases, and the strong stimulus which this has given to preventive medicine. Sanitation is becoming fashionable, and if we may believe some of its votaries, it is a very simple matter to prolong the average life-time to the scriptural, 'three score years and ten.' All that is necessary is that everything shall be clean, and every person virtuous. Having learned to distinguish those diseases which can be prevented much more easily and certainly than they can be cured, we may turn them over to the sanitarian, who has his own battles to fight with ignorance and prejudice. If he succeeds, and so far as he succeeds, he will change, in certain respects, the work of the practitioner.

I come now to the consideration of the second part of my subject, namely, the direction or manner in which we have reason to hope that medicine will be developed in the United States, and the kind of co-operation which you may reasonably expect to receive from the medical profession of that country.

In one sense medicine, as we have it to-day, is the result of co-operation; not of deliberate, centrally planned, and direct co-operation, but of natural selection from results produced by many men, often working at cross-purposes, and, therefore, wasting much energy, but nevertheless working, though blindly, to a common end. And it is safe to predict that in the future much of the best work will be done in the same way, by individual effort inspired by the love of science, by personal ambition, etc. But the results obtained in this way come slowly, and some things that we want can hardly be obtained by individual effort, even if we were willing to wait, hence we must look to organization for help.

In this broader view of co-operation it is interesting to consider those fields of labor to which comparatively few physicians can devote themselves, because of want of time and opportunity, but whose proper working is, nevertheless, of the greatest importance to the practitioner.

One of these is experimental laboratory work, and in this direction the prospect of valuable contributions from America is now exceedingly good. Some of the wisest of our most wealthy men have shown their appreciation of the responsibilities which riches entail on their possessors by seeking new channels through which to benefit their fellowmen. While the old and well-known methods of endowing hospitals and charitable institutions are not neglected, there is apparent an increasing tendency to endeavor to promote the advancement of knowledge, and especially of such knowledge as tends to the mitigation of suffering and the improvement of the race, to furnish means for the investigation of disease, to provide laboratories, and to endow medical schools, and thus place them beyond the reach of the temptations and difficulties which must always exist when such schools are dependent upon the fees of students, and are, therefore, practically commercial manufacturing establishments.

As illustrations of this tendency, I may mention the bequest of £1,400,000 by Johns Hopkins to endow, in the city of Baltimore, a university and a hospital of which the medical department is to be a special feature, to be provided with the best laboratory and other facilities for original investigation as well as for teaching; the gift of Mr. Carnegie to the Bellevue hospital medical school of New York in the shape of a well-equipped pathological laboratory; the presentation by Mr. Vanderbilt and members of his family, to the College of physicians of New York, of £200,000, to provide for that school new buildings and clinics having the best means of teaching and research, and the endowment by an unknown donor, of a laboratory for the University medical college of New York, with the sum of £20,000.

As the class of men who have wealth, leisure, and knowledge becomes greater, there comes an ever increasing demand, not only for the best medical skill, for the most expert practitioner, but also for exhaustive research in every direction which promises to furnish new means for the prevention or relief of suffering, and for warding off, as long as possible, the inevitable end; and hence there is little reason to doubt that the examples I have named will be followed by others in the near future. With such opportunities, and under such conditions and influences, the stimulus to the young and ambitious worker is strong; we have abundance of material of this kind upon which the process of natural selection can operate, and there is little reason to doubt that the result will be substantial and valuable contributions to physiology, pathology, and therapeutics.

There is another most important means of advancing medical and sanitary science which only a government can furnish, and in which field of work England now stands pre-eminent—I refer to vital statistics. In this field, the United States government has thus far done but little, yet enough to show the great interest and value of what we have a right to hope will be done in the future by combining the work of the several states. This is one of the fields in which international co-operation is most desirable; it alone can furnish data sufficiently complete and reliable for a scientific consideration of the relations of disease to geographical and race distinctions.

To illustrate the possibilities in this direction, I will call your attention to some peculiarities in the distribution of deaths from certain causes in different parts of the United States, and for this purpose I shall make use of the data from our last census, taken in 1880. We have no general and uniform system of registration of births and deaths. The larger cities, and about half-a-dozen states, have such a system, but for much the larger portion of the country the only means which we have for determining differences in amount or causes of mortality in different localities is through the census, which is taken once in ten years. The data thus obtained with regard to deaths are imperfect, because when these are collected only at the end of the year, about 30 per cent of the deaths are unrecorded; and they are inaccurate, because the reports of the causes of death are not furnished by persons competent to give reliable information with regard to them. Nevertheless, these data are the best that we have; and although for a large part of the country they do not give us the actual number of deaths from any cause or set of causes, they do furnish some interesting information with regard to the relative prevalence and importance of certain causes, and suggest questions and lines for future investigation, although they do not furnish definite and scientific answers.

Take, for instance, the map of the United States upon which, by varying shades of color, is shown the proportion of deaths reported as due to cancer, as compared with the reported deaths from all causes. (Chart ii.)

The mortality from cancer in the United States is proportionately greatest in the New England states, somewhat less so in New York and Pennsylvania, and it causes the least proportion of deaths in the Mississippi valley and the south generally. The proportion of deaths from cancer in the United States is somewhat greater than it is in England; but it is not possible to make any accurate comparisons in this respect. Now why are the shades on this map so dark in the northeast and so light in the south? In the first place, cancer is a disease the mortality from which steadily increases with advanced age, as you may see from this diagram. Hence, cancer causes a higher proportion of mortality in those localities which have the greatest proportion of population living at advanced ages, and in the United States these localities are the New England states, as you will see by this map. Another explanation of the peculiar shading of the cancer

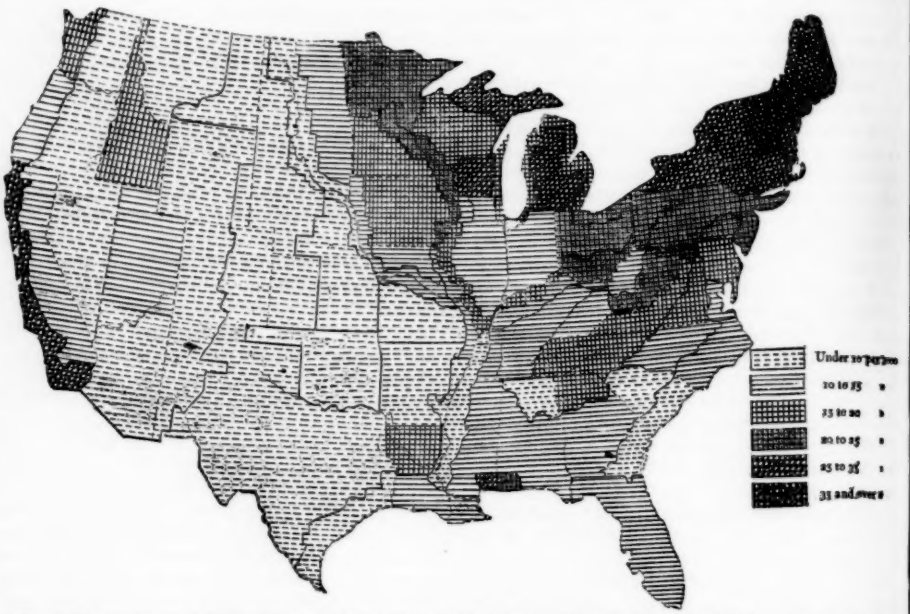

CHART II.—SHOWING THE DISTRIBUTION OF DEATHS FROM CANCER AS COMPARED WITH TOTAL DEATHS FORM KNOWN CAUSES.

map is found in the relations of race to the tendency to death from this disease. The proportion of annual deaths from cancer per hundred thousand living population was, in round numbers, twenty-eight for the whites, and thirteen for the colored. That is to say, cancer is more than twice as prevalent among whites as it is among colored in the same localities, for these figures apply only to the south. On the other hand, cancer appears to cause a greater proportion of deaths in persons of Irish and German parentage, than it does among the rest of the white population, the indications being that between the ages of fifteen and sixty-five, the Germans are especially liable to cancer; more so than the Irish, and decidedly more so than the average white population. Now when we remember that the greater part of the colored population is in the south, and the greater part of the Irish and German population is in the north, we have another reason for the differences in mortality caused by this disease in the two sections.

Scarlet fever is most fatal in the north, and, here again, the influence of race comes in, because in the negro race the mortality from this disease appears to be very low. This disease has always been much rarer in the south than in the north, and the contrast was much stronger in former years than it is at present; but this cannot be explained solely, or even to any great extent, by difference of temperature, because scarlet fever has often been epidemic in the tropics, and, on the other hand, in many localities in temperate climates it is among the rarest of diseases.

Diphtheria has been unusually prevalent in the northern portion of the United States for several years. During the census year it caused 2374 deaths out of every 100,000 deaths from all causes, while in England, for the year 1880, the deaths from diphtheria were 532 per 100,000 deaths from all causes; that is to say, the comparative mortality from this disease in England was less than one-fourth that of the United States for the same period. Diphtheria, again, is essentially a disease of the north, but especially of the north-west. It causes an excessive mortality in children of German parentage, sufficiently so to show that here again the influence of race comes into the problem, although, probably, only indirectly, that is to say, it is probable that it is the habits of a peculiar class of people which favors the propagation of the disease rather than any physical peculiarities in the structure of their bodies.

Consumption is a vague term, and, as used in

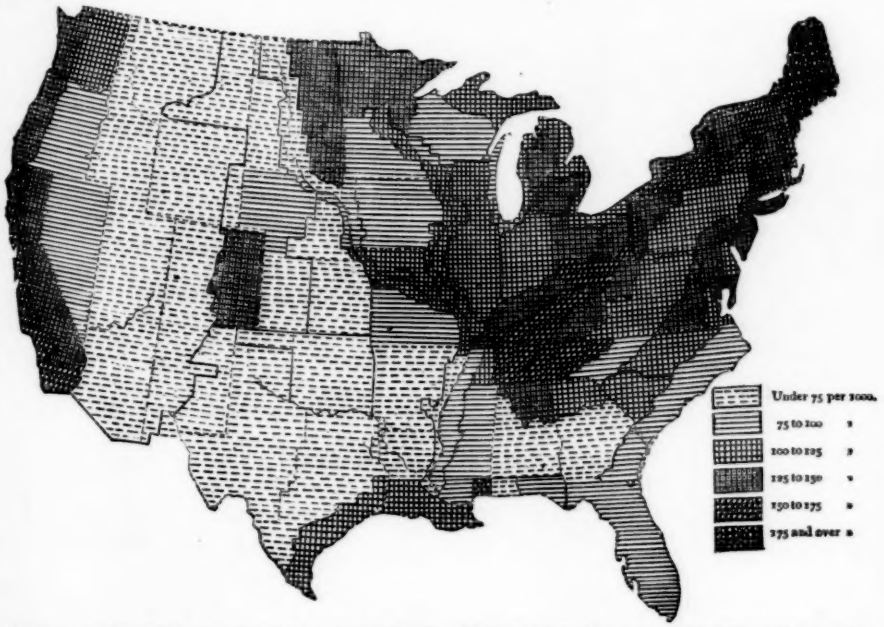

CHART III.—SHOWING THE DISTRIBUTION OF DEATHS FROM CONSUMPTION AS COMPARED WITH DEATHS FROM KNOWN CAUSES.

the census, no doubt includes many cases which were not true tubercular phthisis. It is reported as causing 12 per cent of all the deaths, or more than any other single cause. In England and Wales, in 1880, it caused a little over 9 per cent of all the deaths. Such wholesale ratios are, however, of little interest or value. There are very great differences in the liability to this disease in different parts of the United States, as the map (chart iii.) makes evident: and it is from a study of the causes of these differences in the data derived from large masses of people, combined with clinical histories and experimental laboratory work, that we have good reason to hope to obtain knowledge, not only of the causes of this disease, but of better methods of prevention and treatment than are now at our command. It causes a greater mortality among the Irish than in other white races, and, perhaps, a greater mortality among the colored than among the white.

Next to consumption, pneumonia is reported as causing the greatest number of deaths in the United States during the census-year, giving a ratio of 8.3 per cent of all deaths, as against 4.8 per cent in England and Wales in 1880. Here, again, the local distribution of deaths is interesting, and the contrast between the map of consumption and that of pneumonia (chart iv.) is very striking. Here, again, we find that race peculiarity is an important factor in the problem, the proportion of deaths from pneumonia among the colored being much greater than it is among the white.

While we must consider the difficulties in the way of the improvement of the science and art of medicine, difficulties due to ignorance, to indolence, to conflict of interests, and to the eternal fitness of things, the existence of such difficulties is not a matter to be bemoaned and lamented over. These obstacles are the spice of life, the incentives to action, the source of some of the greatest pleasures which it is given to man to experience. As each man has special opportunities and duties, if he can only recognize them, so it is with guilds, with professions, and with nations. I have tried to indicate to you some of these opportunities which are presenting themselves to my colleagues, your brothers, in the lands beyond the sea, and I hope that I shall not be considered rash, or vainglorious in saying that I believe they will so use those opportunities as to return compound interest for what they have received from the storehouse of our common inheritance.

JOHN S. BILLINGS.

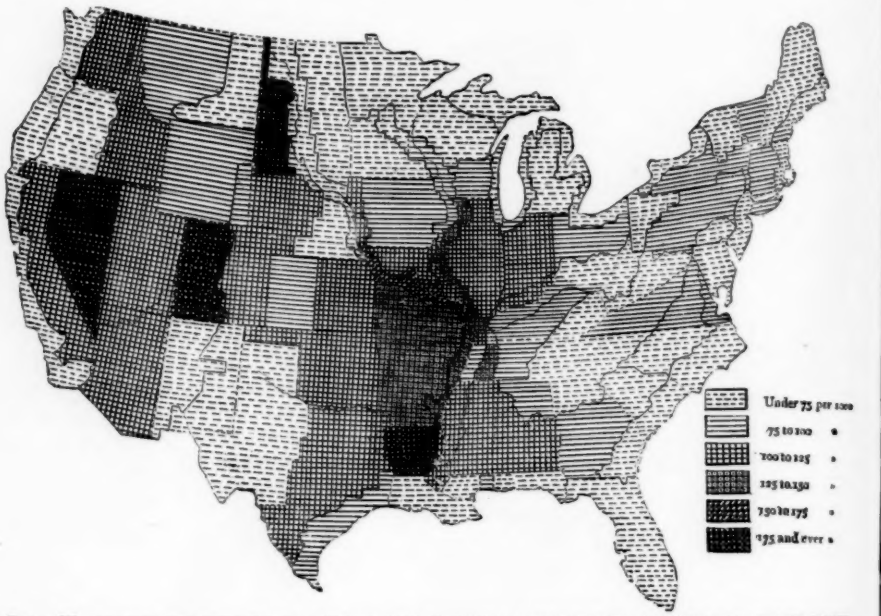

CHART IV.—SHOWING THE DISTRIBUTION OF DEATHS FROM PNEUMONIA AS COMPARED WITH DEATHS FROM KNOWN CAUSES.